ALABAMA

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1839

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F. A. P. BARNARD.

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WITH

GEOLOGICAL NOTES

by

R. T. BRUMBY

University of Alabama,
Nov.1, 1838.

Prof. Barnard:-

I shall endeavor to answer your inquiries very briefly, in the order in which you have proposed them, avoiding, as much as possible, the use of technical terms, and such details as would be interesting to scientific men only. These I may publish, hereafter, in a different form, in some one of the scientific journals. For the imperfections of this communication, I must plead the short period allowed me for its composition, while engaged in the daily discharge of laborious duties.

1. "The geographical situation and extent of the coal formations of Alabama?"

There appear to be three distinct coal-fields in the central and northern parts of the State, separated by low ranges of transition mountains.

One extends through Tuscaloosa, Walker, Jefferson, and Blount Counties, on both sides of the Warrior river, and its several branches. It was first discovered about seventeen years ago, by the late Rev. Dr. Kennon, as he informed me, in the bed of the river, not far from the spot where the Tuscaloosa Bridge now stands. Several other important localities were soon discovered in the river, or its tributaries. It has since been found in numberous places, and not a doubt

can now be entertained, that it is eighty or a hundred miles long, and from ten to thirty miles wide.

Another of equal length and breadth extends through Bibb, Shelby, Jefferson and St.Clair Counties, from near Centreville to the sources of the Cahawba river.

Of the extent of the third, which is in the Tennessee Valley, I am not correctly informed, but it has been found in Jackson and Lawrence, and I have one fine specimen from Madison County. It may be a continuation of one of the others, or of that which lies chiefly in Tennessee; but I think not, and this opinion is founded on the physical geography of the country, the height and direction of the intervening mountain chains, and the courses of the rivers. That the two first are entirely distinct is evident from these facts. They are separated, through their whole extent, by a pretty broad but low chain of transition mountains, which I have crossed in several places, and in which no coal has been found. The strata, on the eastern and western sides of this chain, dip in opposite directions. It is evident, therefore, that the coal region of this State is of extraordinary extent, though its limits have not been fully ascertained. In my opinion no State of the Union is more abundantly supplied with this necessary article.

2. "The quality of the coal?"

It is a bituminous caking coal, hard, compact, very light; sp. gr.from 1.27 to 1.35; breaks generally into rhomboidal fragments and burns with a brilliant flame. It is very similar to the best Liverpool coal, with which I have compared it, and is equally good except when obtained from superficial strata. I have one specimen which is of a slaty structure, and it is said to be abundant in Blount. It is

what Dr. Thompson calls cherry coal. I have others which resemble the splint coal of the same author; but they are merely purer varieties of bituminous coal. No Anthracite has been discovered.

3. "The usual number and thickness of the strata?"

All coal-fields differ in these respects; indeed two adjacent mines seldom correspond in every particular. Hence, as the superficial or exposed strata only have been wrought, and as the lower ones have not been perforated by boring, or in any other way, it is impossible to form a correct opinion of their number and thickness. It is, however, a well established principle of geology, that coal basins usually contain from three to ten, and even more strata of coal, lying one over another, separated by strata of gravel, clay, shale, slate, sandstone, iron-stone, or some other analogous rock; that the superficial strata are generally thin and inferior in quality; that they are much thicker and better at a greater depth below the surface; and that they extend in continuous beds, through hills and even mountains, from the centre to the extremities of the basin, except when broken or thrown out of place by dykes or other causes. In some places in this State, two, three, and even more beds, may be found lying, regularly, one above another the lowest being always thickest and best, in conformity with the principle just stated. This is the case where the water courses have cut through the strata, as at Addison's mine, ten miles above this place; or where subterranean forces have elevated the rocks, as in some of the mountains farther north. Hence, we may infer with certainty, that by mining operations, better and thicker beds might be found, at no great distance below.

Those which have been excavated and raised in this vicinity, by removing the superficial gravel, shale, &c., are usually from ten inches to three feet thick. The thickest bed of which I have any knowledge, is in Jefferson County. I obtained specimens of it from large fragments which I saw in the possession of the proprietor, Maj. Steele of Elyton, who supplied me with specimens from various other mines, which he had purchased or secured by entry, in Jefferson, Blount, and Walker Counties. He says that many of the beds are more than three feet thick. It is a remarkable fact, that the coal in this State lies near the surface. In many places it is exposed to view in the beds of rivulets, creeks and rivers; and at Schneider's eleven miles from this place, near the Huntsville Road, I observed that in some places it is covered by a few feet of sand and gravel only, and in others a thin stratum of soft blue shale separates it from the sand and gravel. In general, as in other coal regions, the shale and other rocks contain beautifully distinct impressions of the leaves, stems, bark, and roots of ferns, calamites, and other extinct vegetables, which much have grown in a torrid climate and in marshy land. As the bed of the river consists of regularly stratified rocks, filled with these vegetables, it is evident that the vegetables grew there, and the rocks were deposited before the country was finally elevated to its present level. Since that time, the river has conveyed to the ocean the water of springs, &c., which had previously flowed into the lakes and marshes, in which the coal had been deposited.

4. "Whether it might be safely and profitably wrought by mining (i.e.) without removing the superincumbent earth?"

That it could be safely wrought in

this way, is evident: but in many places it is so abundant near the surface and in the river as to have induced the opinion that mining could not, at present, be attempted with profit. This, however, is a mistake: the mode now practiced of raising the coal, is, of all others, the most expensive. Experience has proved that the expense of sinking shafts through the thin superficial beds to those which are thicker; of supporting with roofs the superincumbent rocks, as the coal is removed; and of draining the mines, and raising the coal to the surface by machinery, is much less in proportion to the quantity obtained, than when it is procured by digging away only a few feet of gravel from a thin bed near the surface. Hence, at the Virginia and Pennsylvania mines, coal is not worth more than four or five cents a bushel; and in England where it is frequently raised from a thousand feet below the surface, or transported to market in subterranean canals, cut to the mines through hills and mountains, it is worth still less. At one place it is worked more than 5,000 feet below the sea.

To render mining operations profitable, however, they must be connected with a good market, by natural or artificial means of cheap and rapid transportation; and this brings me to our fifth inquiry:

5. "The facilities of transportation to market?"

The demand for coal, even now, is very considerable, in the various towns and villages on the river, and especially in Mobile, and it must augment rapidly, as timber becomes more scarce and manufactures increase. No attempt has been made to ascertain the amount consumed annually. It must,

however, be small in consequence of the exorbitant price demanded for it. The only mode of transportation is in wagons, and hence, it has, for several years, sold readily at twenty, twenty-five and even thirty-seven cents a bushel. It is true that a fine river runs through the heart of the coal formation, and that attempts have been made to bring down coal from its immense repositories in flat-bottomed boats, during the winter freshlets; but the river is obstructed by shoals, which it is difficult to avoid, and hence the boats and their cargoes are frequently lost. An effort was made last winter to obtain an appropriation of $50,000 to remove the obstructions, but our economical legislature refused to grant it. Until the river is rendered navigable, which experienced individuals affirm can be accomplished with an inconsiderable sum, or rail-roads are constructed, the coal, iron, marbles, limestone and other mineral resources, with which the interior abounds, must remain buried in their native mountains. It would be out of place here, but it would not be difficult to prove, that such improvements would add greatly to the honor and prosperity of the State, as well as to the comfort of her citizens, and that it is the duty of wise legislators to make ample provision at once, for the development of her physical resources by appropriating annually her whole income, and by borrowing more if necessary. No one can doubt this who is acquainted with the histories of other states.

6. "Similar particulars regarding the iron ores of the state, so far as the above inquiries are applicable?"

I have not room to answer this question fully, for iron ore is very generally

disseminated. I have seen it in numerous places not rich enough, however, to be worth working. The ores which are richest and yield the best quality of metal are generally found in primitive, transition, or secondary rocks. Hence, as these rocks occur chiefly in the interior and northern counties, these are found to contain it more abundantly, especially in the vicinity of coal and limestone, with which, for wise purposes, iron is usually, if not always, associated. It is abundant in Bibb, Shelby, Jefferson and Blount counties. It is abundant, I am informed, in Franklin also, where iron works have been established near Russelville. A few miles below Havana, in Greene County, I observed a small vein of aluminous oxide of iron, and as it is situated in the midst of hills of secondary rocks, it is highly probable that larger quantities might be found. It would be a very advantageous situation; timber is abundant, the land which is generally poor, is vacant, and a navigable river flows through it.

7. "The kinds of ore, quality, &c., facilities of exploring and smelting, as well as of transporting to market. Also, the probable quantity in important localities?"

The brown and red hematites, and the aluminous oxides and carbonates of iron, are the predominant ores. I have not seen any of the magnetic oxides, except in small quantities mixed with the other varieties.

The hematites exist in immense quantities and of superior quality. I can mention a few only of the localities which I have seen. At Murphy's, on the Huntsville road, thirty miles from Tuscaloosa, the brown hematite, mixed with other varieties, is exceedingly abundant. It is imbedded in

silicious beds of red clay, but rises to the surface and large fragments are spread over the surface. These have been piled up in the fields, out of the way of the plough in surprising quantities. In several places the rains have cut channels into the sides of the hills, exposing it to view for many hundred feet. I obtained beautiful and rich specimens of it, and ascertained that it had been tried in a forge a few miles off, and yielded excellent iron. A bold stream flows at the base of the hills; limestone strata rise to the surface in various places; grey-wacke sandstone constitutes the principal part of a mountain which is quite near; and coal beds are found in the vicinity. Hence, at this place nature has provided all the means of manufacturing iron:- ore abundant and rich; coal to fuse it; limestone to smelt it; stone to build furnaces; and water power to propel the machinery. I found the same ore in the road, four miles nearer to Tuscaloosa, and in several other places, north and south of Murphy's.

More than a year ago, I saw four miles above Centreville, at the falls of the Cahawba, inexhaustible quantities of the aluminous oxide of iron, very similar to what is found in the Genesee country, New York. Like the ore at Murphy's, it is surrounded with all the facilities for smelting it, and it is within three-quarters of a mile of the river. It is abundant for several miles higher up the river. A few months ago I passed banks of the ore that had been raised for a forge, which has been erected near the road from Montevallo to Centreville. It appeared to be of a good quality, though not so rich as what I had seen elsewhere. Indeed, what I have seen has satisfied me

that Alabama possesses all the facilities for manufacturing iron, and that the period is not distant when her interior will contain many flourishing forges and furnaces. Wages of labor are now high, and transportation is expensive, but time and capital will remove these difficulties.

8. "The marbles - and other building stone - where, of what quality and quantity, and other particulars, as above?"

Limestones are so abundant in the state that it is probable that many beautiful marbles will be found. I know of but two quarries - one is in Talladega, the other extends up the Cahawba river several miles above Centreville. I have not visited the former, but having seen slabs of it at Shelby Springs, I incorporated the description of it in the account of my examination of these waters.

Two years ago I examined the former in company with Col. S. W. Davidson, who owns a part of it. It is a well defined transition limestone, of various shades of color, generally light grey, or chocolate brown, with small white spots intermixed with red. The strata rise boldly to the surface; are of great but unknown thickness; dip at an angle of about forty degrees, to the south east; and run across the river from north east to south west. They are much shattered, and perforated by cylindrical cavities of extraordinary size and depth. Huge masses of the rock can, however, be obtained. It is hard, crystalline, coarse grained, and susceptible of high polish. It is composed, in a large degree, of the petrified shells and exuviae of marine animals; and these give it a beautifully

variegated aspect. A mill has been erected for sawing it into slabs, and workmen are now engaged in working it.

The sandstone quarry near this place supplied the foundation work and also the pillars of the State House, college edifices, and other public and private buildings. It is abundant, and splits readily; but it is soft and absorbs water which freezes and causes the rock to crumble. Besides, the cement is the protoxide of iron which absorbs oxygen as soon as it is exposed to the air and becomes pulverulent and yellow. Hence, the foundations of all such buildings, if not speedily protected from the air, and moisture by a thick coat of plaster, or some other means, must give way in a comparatively short time.

9. "Any other species of mineral wealth which may hereafter be available?"

I have five several specimens of lead ore (sulphuret of lead, or galena) which were found by different individuals in the southern part of this county, and in Perry. I have also two specimens of molybdate of lead, which came, I am told, from the hills in Sumter County, on the other side of the Tombecbee. It is highly probable, therefore, that a scientific examination of these counties would result in the discovery of rich mines of lead. Gold has been found in Autauga and Randolph counties. It appears to be a continuation of the gold region first discovered in North Carolina but since traced through Maryland, Virginia, South Carolina, and Georgia. The whole southern half of the state contains extensive beds of mark and shell limestone, which may hereafter be beneficially used as manure. In

some places they rise to the surface but in others are covered with alluvial deposits of clay, sand and gravel.

10. "The amount of water power in the parts of the state where it is most needed for smelting iron, &c., and generally the natural facilities for developing the mineral resources which may result from the relative situation of the deposits and the water courses?"

This question embraces much of the hydrology of the state. It is of great importance, so much so indeed, that our legislature would act wisely by imitating Maryland, in the immediate appointment of a scientific individual to examine it fully. I can only say generally, that the Warrior and Cahawba rivers, with their numerous branches and tributaries, afford, in my opinion, unequalled facilities for manufacturies of every kind. Several instances have already been given, and others might be mentioned, but it is sufficient to say, that abundant water power can generally be had in the immediate vicinity of the great depositories of iron ore.

11. "Give the outlines of the geology of the parts of the state which you saw in your late excursion to the springs; a description of such as you analyzed, with the results of your analysis; and localities of any other mineral waters of Alabama?"

I went to Blount springs, early in August last, at the request of the proprietor, and took with me tests prepared with great care; the hydrostatic balance of the University, in which the thousandth of a grain may be weighed with accuracy; and other necessary instruments of the best quality.

The road for twenty miles, passes over diluvial hills of moderate elevation, which consist of nearly horizontal strata of clay, sand and gravel, resting on the coal formation, the sandstones and ironstones of which, rise occasionally to the surface. This is the case at this place, near the sixth mile-post; at the creek near Coles's, two miles further; in various places near Wilson's; and at Wheelock's, sixteen miles from Tuscaloosa. The coal appears to lie north of the road exclusively, but crops cut sometimes quite near it, as at Schneider's mine. I inquired particularly, and was informed that it has not yet been found south of the road. All the strata of the coal formation, in this part of it, dip to the north west, but are very slightly inclined. The soil is very poor, and the growth consists of pine, oak, chestnut, &c. I think iron ore of good quality can be found in the hills.

At the distance of twenty miles, the direction of the road changes to north east, and continues twenty miles over transition rocks, coverted generally by alluvial and diluvial deposits of sand and gravel. The principal rocks are limestone, graywacke, sandstone, coarse gritstone, and hornstone. I did not ascertain their thickness and relative position. The limestone is abundant, and variously colored, generally bluish grey. It is hard, more or less silicious, crystalline, and in many places contains the characteristic fossils especially Enerinites, (screw stones) and the Productus. The gritstone is used for millstones, and answers the purpose very well. It is white, or yellowish white. Iron ore is found in immense quantities, and of a good quality. Vegetation is

luxuriant, springs and streams are numerous, the soil though generally poor, is frequently productive, and the great abundance of limestone will enable the farmers to apply a good manure. These hills constitute a part of the ridge which separates the Warrior and Cahawba basins.

The next twenty miles, principally through Jones's Valley, present very remarkable geological features. The vally is long, narrow, very fertile and generally level. The rocks, chiefly limestones of every color, are sometimes horizontal, sometimes inclined in various directions, and at various angles, but generally nearly perpendicular. In several places, the road, which is quite level, but rough, passes for miles over the edges of these vertical strata, running in a straight line, from north east to south west, like boards placed on their edges. It is bounded east and west by parallel chains of pretty high mountains of transition rocks, but whether those in the vally itself belong to the secondary or transition series, I was not able to decide, in consequence of the total absence of organic remains, so far as I coulo perceive, and the irregularities in the position and dip of the rocks. The limestones bear in some places so close a resemblance to the lias and oolitic limestones of England, that I am inclined to think they belong to the lower secondary rocks.

To account for the phenomena described above, Dr. W. B. Powel, in a letter addressed to me, and published in the Democrat, conjectures, "that there has been an immense cavern in this valley, and that the super strata have fallen in. I saw an instance

in Virginia, but on a smaller scale."

To this theory, I saw many insurmountable objections, and the valley will, I think, when it is more minutely examined, be found to be the bed of a lake, which was laid dry when the country was elevated to its present level, an elevation which, I have already mentioned, must have been subsequent to the deposition of the coal, but at what geological period, I have not yet ascertained. By this elevation, the upper strata were fractured, and fell into vertical fissures.

At Elyton, there is a beautiful limestone spring (for in the valley you find no other water) which is remarkable for its size, depth and limpidity. It is about fifteen feet in diameter, and affords sufficient water to turn a mill. The sides of it are covered to a depth of ten feet, with vegetables growing luxuriantly.

Three miles beyond Elyton, in the valley of a creek, I saw a remarkable mound, about three hundred feet in diameter, forty or fifty feet high, nearly circular, level on the top, and covered with small trees. It is supposed by the inhabitants of the vicinity to have been raised by the Indians, and in confirmation of this opinion, they urge several arguments; but it appears to me to be a natural elevation. In a hard grey limestone, quite near the mound, there are cavities in the shape of mortars, eight or ten inches deep, which were fashioned by the Indians for pounding their grain. That they were formed by art is manifest, not only from their shape and size, which are the same in all, but from the rim which surrounds them.

For the next fifteen miles, the road extends due north, across a barren ridge of transition rocks, similar to those which have been described, except that on the western side, I saw no limestone but a great deal of coarse, dark colored slate, especially in the channels of several streams. A few miles on each side of the Locust Fork of the Warrior and especially in the river, the sandstones and other rocks of the coal formation are abundant; and rich beds of coal have been found above and below the ferry in various places. I went up the river a mile in a canoe in search of one, but it is several feet under water, and I failed to find it. The coal formation, at this point, is quite narrow, and the hills are high and rugged.

Having crossed the river, which is only twelve miles from the springs, I soon found myself again in the transition series; for it is a remarkable feature in the geology of Alabama, that numerous low parallel ridges of mountains run through the interior from north east to south west. These ridges, in which granite and other primitive rocks do not rise to the surface, but which consist almost exclusively of rocks corresponding in all respects with the descriptions given by English geologists, of the slates, limestones, greywackes, &c., of the transition period, appear to be branches of the Cumberland chain. Ascending one of these, over a gentle, but uninterrupted, inclined plane of nature's construction, the road is excellent for six miles. Here the scene changes suddenly, and numerous high, abrupt, rocky hills, and deep, dark, narrow valleys present themselves, rendering travelling at once laborious and interesting. The ascent continues, however, to the top of the mountain, at the base of which the springs issue. Proceeding about a

mile on its summit, over a smooth road, the traveller, exhilarated by the fine scenery, and bland atmosphere, begins his descent through a narrow channel between two steep projections of the mountain, covered with luxuriant vegetation; and though admonished by the strong smell of sulphuretted hydrogen of their proximity, the springs, the buildings, and the clusters of visitors, appear before him quite unexpectedly. The springs are situated in a small triangular valley, surrounded by mountains of considerable elevation, and the effect of the picturesque scenery is greatly enhanced, when the visitor is taken into a portico, on the north end of the hotel, whence he looks down into a long valley at the foot of a mountain not half a mile off, which sweeps boldly across the country from east to west, and presents to his excited imagination masses of rocks heaped in confusion on its precipitous sides.

The geology of the place is very interesting. The rock through which the springs rise, is a well defined transition limestone, analogous in many respects to the best specimens of English mountain limestone, which I possess. It rests on coarse slate, and is regularly stratified, but much fractured. It is considerably inclined, and dips to the north-west; is crystalline, somewhat coarse-grained, very hard, and susceptible, I think, of a good polish. Its color is grey, or bluish grey, with numerous white spots, caused by the remains of Pentacrinites, Madrepores, Encrinites, Alcyonia, Caryophillites, Orthoceratites, Trilobites, the Productus, and other characteristic fossils, generally broken, but sometimes in a high state of preservation. On the limestone rests a

thick bed of black fissile, brittle shale, which is easily quarried and which has been used in the construction of walls and pavements. It is impregnated with iron pyrites by the decomposition of which the walls about the spring are coated with a thin crust of alum, mixed with a little copperas, and much earthy matter. Fragments of hornstone, and other allied rocks, composed almost entirely of Encrinites, but rendered porous by fusion, prove the volcanic origin of the mountains, the summits of which are capped with coarse, white, silicious greywacke sandstone, shattered and thrown out of place. About a mile off, there is a small cave, which may be easily entered; and, from the summit of a mountain which may be conveniently ascended on horseback, the lover of romantic scenery may have a magnificent prospect of mountains, water courses, glens and dales extending in almost all directions to the distance, it is said, of thirty or forty miles. Dr. Powel, a good geologist, who has been at the Virginia springs, says, in the letter already referred to, "the geological phenomena, at and about these springs, prove beyond a doubt, that they are located in the same geological place as the Red and White Sulphur Springs of Virginia. And, furthermore, the Virginia Springs possess no advantages over these, either as regards the waters or mountain scenery."

It is, in my opinion, an extraordinary locality of mineral waters. Sixteen sulphureous springs, differing in a greater or less degree, and many of them essentially, rise through solid rock within a circle of a few hundred feet in diameter. He who needs an antacid, can drink of a limestone spring of the purest quality; he who wants a tonic, can resort to a chalybeate in the immediate vicinity; and he whose disease requires, or whose appetite

craves sulphur water of any kind, can find it in the White, Black, Red and Sweet Sulphur Springs, which gush in profusion, and of various degrees of strength, from almost every crevice in the rock.

These names, which are applied to similar waters in other places, were taken, I presume, from the color of the sediment, or some other striking property. Thus, the name White Sulphur is applied to those which have a milky translucency; caused by a copious deposition of the carbonates of lime and magnesia; Black Sulphur to those which yield a copious black sediment of sulphuret of iron; and Red Sulphur to those in which the black sulphur is covered with a thin red film of bi-sulphuret and peroxide of iron.

And though these springs differ so strikingly, in these and other respects, yet, when analyzed, they may appear to contain nearly the same substances. It must be remembered, however, that these substances are chemically combined; and that, in a chemical compound, the presence or absence of an apparently small quantity of some ingredient, or a slight difference in its proportion, often produces the most striking effect. Thus, 202 parts of mercury and 36 of Chlorine, yield calomel; but 202 of mercury and 72 of chlorine, yield corrosive sublimate, an active caustic, and deadly poison. A still more striking example is found in sugar, starch, and gum-arabic, which are composed of:-

	Carbon	- Hydrogen	- Oxygen	
Sugar	42,85	6,35...	50,80	100 pts.
Starch	43,55	6,77...	49,68	" "
Gum-arabic	42,23	6,93...	50,84	" "

I remained a month, laboriously but delightfully engaged in prosecuting my investigations. The geological position was first ascertained, and the springs were carefully numbered. Their temperature, and other obvious properties, were noted three times - at sunrise, about noon, and in the evening.

The range of temperature is about twelve degrees, Farenheit's thermometer, - the coldest being 58°, the warmest, 70°F.,- which was, I think, slightly affected by its exposed situation.

The springs are beautifully limpid, except that which is called the Old White Sulphur. It is transparent, or nearly so, in a tumbler, but in the spring which is large and runs boldly, it has the translucency of water poured in a vessel that has contained milk.

The sediment of most of the springs is very copious, and nothing can exceed the beauty of the rich, red, vermillion film, which is delicately spread over the bottom of some, forming a fine contrast with the dense but variagated black sulphuret of iron which lies below.

Eight or ten were then carefully tested three times, and the indications registered. The first testing was with water fresh from the spring; the second, with what had been set aside in glass decanters, and occasionally observed, at least twenty-four hours; the third, with what had been thoroughly boiled in glass flasks, or bottles. A detail of the numerous processes employed would be uninteresting, if not unintelligible, to general readers; and I shall, therefore,

omit it. It is sufficient to say, that having satisfactorily ascertained their ingredients, by the most unerring tests, I proceeded to the analysis of five of the springs, the results only of which can be stated.

I. RED SULPHUR, NO. 1.
Sediment, black, red and white.
Temperature 60° F.
Each wine pint contains:

Carbonic acid gas	75	cu.in.
Hydro sulphuric acid gas, (Sulphuretted Hydrogen)....	1.87	
	2.62	

Chloride of Sodium (Muriate of soda).....	4.04	grs.
Chloride of magnesia.....	.75	
Sulphate of magnesia (Epsom salts).....	.20	
Carbonate of lime.....	.85	
" of magnesia.....	.55	
" of iron.....	.20	
Solid contents.....	6.63	

II. RED SULPHUR, NO. 2.
Sediment, black, red and white.
Temperature 62° F.
A wine pint contains:

Carbonic acid	1.00	cu.in.
Hydro sulphuric acid.....	1.60	
	2.60	

Chloride of Sodium(common salt)	4.00
Chloride of magnesia.....	.56
Sulphate of magnesia.....	.20
Carbonate of lime.....	.60
" of magnesia.....	.40
" of iron.....	.20
	5.96

III. RED SULPHUR, NO.3.
Sediment, black, red and white.
Temperature 62° F.
A wine pint contains:

Carbonic acid.....	.50	cu.in.
Hydro sulphuric acid....	1.40	
	1.90	
Chloride of sodium.....	4.00	grs.
" of magnesia....	.56	
Sulphate of "	.20	
Carbonate of lime.....	.60	
" of magnesia...	.40	
" of iron.....	.20	
Solid contents.....	5.96	

IV. STRONG WHITE SULPHUR.
(Discovered this year)
Sediment white with a little black.
Temperature 62° F.
A wine pint contains:

Carbonic acid.....	2.00	cu.in.
Hydro sulphuric acid...	1.49	
	3.49	
Chloride of sodium.....	3.62	grs.
Sulphate of magnesia...	.75	
Carbonate of lime.....	1.00	
" of magnesia..	.88	
" of iron, a trace.	---	
Solid contents....	6.25	

V. SWEET SULPHUR.
Sediment, black, red, green and white.
Temperature 61° F.
A wine pint contains:

Carbonic acid.....	0.75	cu.in.
Hydro sulphuric acid.....	1.57	
	2.32	
Chloride of sodium.....	* 6	grs.
Sulphate of magnesia.....	*	
Carbonate of lime.....	*	
" of magnesia.....	.45	
" of iron.....	.14	
Solid contents.....	5.31	

[* Section of the page from which this manuscript was copied was so badly mutilated as to be illegible.]

My analysis may not indicate, with rigid accuracy, the quantities of the several salts found in the waters. My time was limited, and I did not regard it as particularly important to do more than ascertain the kinds of gaseous matter and the quantity of each; the saline constituents and their modes of combination; and the exact amount of saline matter in a measured quantity of water. In the separation of the salts, I was satisfied with an approximate amount of each, especially as I intended to visit the springs again to review the analysis.

This is, however, as much as is expressed in the best analyses of mineral waters. Marcet, Gay-Lussac, and Klaproth each analyzed the waters of the Dead Sea. Their results correspond remarkably as to the ingredients and the amount of solid matter, but differ materially as to the quantities of

the several salts. Besides, it is now admitted, that the salts obtained by analysis may be merely products, and that their constituents may be combined very differently in the water as it flows from the spring.

Still, my results may, I think, be relied on, as very nearly correct. My tests were delicate and my apparatus excellent. I pursued implicitly and with the most sedulous care, the directions given by distinguished chemists and having repeated all difficult processes three times, adopted the mean result.

The quantities of the gases are expressed in cubic inches and hundredths; and those of the salts, in grains and hundredths. The results were obtained for thousandths, but it is thought unnecessary to publish them.

Not a doubt can remain that these springs are very strong sulphureous waters. In this respect, especially, they compare well with the strongest and most celebrated European waters that have been analyzed. This will appear from the following statement:-

Aix-La-Chapelle Spring contains, in a part-
5.50 cub.in.sulp.hydrogen.
Cheltenham Spring contains, in a part-
2.50 cub.in.sulp.hydrogen.
Moffat Spring contains, in a part-
1.20 cub.in.sulp.hydrogen.
Harrowgate Old Well Spring contains, in a pt.
1.75 cub.in.sulp.hydrogen.
Harrowgate New Well Spring contains, in a pt.
.80 cub.in.sulp.hydrogen.

In saline matter, they fall short of all these except Moffat, which has only 4.50 grains in a pint. A large quantity of saline

ingredients constitutes what is called a salt sulphur, and the Blount waters may be rendered cathartic by the addition of a teaspoonful of Epsom or common salts. This should be done in the morning and the draught is not nauseous.

This must, I think, be regarded as an advantage instead of a disadvantage to these springs; and in this opinion the best physicians, with whom I conversed, concurred. A large quantity of cathartic salts would limit their use to a few persons and counteract their other effects.

I tested the two springs which were analyzed eight years ago by Professor King and found that he indicated their constituents correctly; but, thought I did not analyze them, I am satisfied that in consequence of the imperfections of his instruments he erred in the quantity both of gaseous and solid matter. By his analysis, six cubic inches of one, gave two and a half, and the same quantity of the other, two cubic inches of gas chiefly sulphuretted by hydrogen. Hence, as a pint of water contains nearly twenty-nine cubic inches (28.875) his analysis gives more than ten cubic inches to a pint - a quantity which has never been found in any water.

All the springs appear to come from one general fountain deeply seated in the earth, and their difference in temperature, strength, and composition, may be caused by the substances through which they flow, in their various channels toward the surface. However this may be, it is certain that they produce different effects on the system. This point has been established by experience

and is believed by those who have long used the waters and observed their effect on others.

It is evident from their mineral and gaseous impregnation that they must produce decided antacid, tonic, diuretic, diaphoretic, and in may cases cathartic effects. They have been found very efficacious in removing glandular and cutaneous diseases, caused by mercurial preparations, and in curing rheumatism.

These effects are doubtless promoted by relaxation of mind, agreeable exercise, and the excitement of society; still these alone could not, in a few weeks, enable the cripped rheumatic to dance, the desponding dyspeptic to digest his dinner, nor restore him to sound health, whose debilitated, ulcerated frame had, for years, been the prey of mercurial disease. Such cases have been effectually relieved by the use of these waters.

It may be proper to state that while at the springs I conversed with several intelligent gentlemen who had, a short time before, been at the Red and White Sulphur Springs in Virginia. They concurred in the opinion that the corresponding Blount Springs are not inferior in any respect. I have not yet seen Professor Rodgers's analysis, and have not, therefore, any scientific data on which to found a comparison.

Efficacious and palatable as these waters are, however, those who resort to them would do well to use them cautiously, and, if possible, with the advice of a skilled physician. It is folly to drink them as

many people do, unless one has the capacity of a camel of the African desert, and expected, like that animal, to drink only at long intervals. "The sulphuretted hydrogen and salt of iron which they contain, are highly stimulating and tonic, and should be taken into the system in moderation, especially at first." An individual should begin his course of drinking with five or six tumblers full a day, from one of the weakest springs, and pass gradually to those which are stronger.

I went next to Shelby Springs at the request of the proprietors.- Having returned to Elyton, I took the main road to Montevallo, and found the country extremely interesting to the geologist. The first four miles were through a narrow gap, between two mountains of transition rocks. The one to the left is nearly parallel to the road, and has on its summit another road which affords, it is said, beautiful prospects. It passes by the Mountain Spring, four miles from Elyton. Here buildings have been erected for the accomodation of visitors.

Twelve or fourteen miles from Elyton, the coal strata of the Cahawba coal basin appear and continue several miles after crossing the river. I saw no beds of it but it has been found in many places. There is a demand for it where it is found, and as the river is not navigable, it cannot be transported to market. It must, however, be regarded as an inexhaustible deposit of mineral wealth for future generations.

Fifteen miles from Shelby Springs I left the road to Montevallo and soon passed near the Sulphur Springs (four or five in

number) which have recently been discovered. The gentleman who entered the land and who has since sold it to the proprietors of the Sulphur Springs, assures me that they are genuine red sulphur waters, though not very strong.

West of these springs I passed through a small prairie, which convinced me that the secondary rocks in this part of the state are covered, in part at least, by tertiary strata. In 1831, I saw similar patches of prairie near the Coosa river, in the eastern part of Shelby county.

The Shelby Springs are situated on a small stream in a broad valley which affords ample room for buildings, gardens, and cornfields; and though the locality wants the romantic interest of the mountain scenery of Blount, it is, in some degree, compensated by the air of superior comfort and elegence. The hotel, cabins, bathing house, &c., all admirably constructed, form a large square, in the center of which bursts forth the water, quite above the ground, from three handsome marble fountains, stationed in square marble slabs, and surrounded by native monarchs of the forest, which form a dense shade over the green benches that encircle the springs.

The improvements already made are creditable to the wealthy and tasty proprietors; and they are continually adding to the beauty and comfort of the place. And such is the superior quality of their table that the most fastidious gourmand need go no farther to find wherewith to gratify his appetite.

The marble structures were obtained

at the Talladega quarry where this material is said to be abundant. It is white, crystalline, finely granular, and susceptible of a high polish, but is fractured, stained with dark stripes and rather soft. These defects may be confined, in part at least, to the superficial portions, which alone have been cut and polished. It contains no organic remains but I am inclined to think it is a transition limestone.

The geological character of the valley is distinctly marked. The springs rise through compact blue fetid limestone, which is traversed by numerous hard seams similar to those found in Septaria. It evidently belongs to the older secondary series, and rests on coarse slate which appears in the bed of the creek about a mile off on the road to Columbiana. Indeed, the whole neighborhood is, as far as I could judge, of the same formation. The hills in the vicinity and at the springs are covered with fragments of a peculiar reddish white sandstone, which is coated with minute but beautifully distinct crystals of quartz.

Most of the fragments are similar to those which I had observed on the hills for fifteen miles before I reached the springs and are apparently from very hard silicious sandstone of a reddish brown color. It resembles no rock with which I am acquainted so much as the fine grained old red sandstone of England. I did not observe it in place, and, therefore, cannot assign its geological character, especially as it contains no organic remains. It some respects it corresponds with basalt, and has manifestly been exposed to a high temperature. Iron ore is abundant in the vicinity; and from one mine

six miles distant, I obtained several fine specimens of brown and red hematite. It is a rich ore, and would yield iron of excellent quality. The soil is generally thin and broken, but small farms of productive land are not uncommon; and the great quantities of limestone, found almost everywhere, will enable the agriculturist to apply a cheap manure. Timber for fuel, large creeks for water power, stone for building furnaces, and limestone for smelting the ore, are so abundant in various places of the country that it must ultimately become the seat of extensive manufactories of iron.

There are three kinds of water at Shelby Springs, - limestone, chalybeate and sulphureous. I tested all the springs carefully, but analyzed only one of the sulphur springs, of which there are three, not many yards from each other. They correspond so well in taste, color of sediment, temperature, and especially intthe effects of chemical reagents, that I think they proceed from the same fountain. They are slightly impregnated with sulphuretted hydrogen and carbonic acid gases, and the saline constituents are in small quantity. Still the water is cool and pure, and may produce salutary effects on the system; for the efficiency of a mineral water is not exactly proportioned to its strength. On the contrary, it is admitted, by medical writers, that such waters are much more efficacious than an equal amount of an artificial preparation of the substances which they contain.

My analysis of the springs gave the following results:-

The Sulphureous springs, Nos. 1, 2, 3:
Sediment white, not copious.
Temperature 63° F:
Each wine pint contains of:

Carbonic acid gas..... } Sulphuretted hydrogen. }	Quantity not ascertained
Carbonate of lime.....	0.65 grains
" of magnesia.	0.35
Sulphate of lime.....	0.20
Muriate of soda.....	0.05
" of iron, a trace	----
	1.25

Two chalybeate springs contain the carbonates of lime, magnesia and lime.

The Limestone Spring, which flows into a marble basin several feet below the surface of the ground, and is approached by a quadrangular flight of steps, contains the carbonates of lime and magnesia.

I remained only a week at this place, for ten days only of our vacation were left, and I had accepted an invitation to Talladega Springs, eighteen miles distant in an eastern direction. The country between the two places presents no remarkable geological features. It consists of one of those low ridges of secondary and transition rocks which have already been described. The hills are rather low, barren, and covered with dense forests. The diluvial strata are very thick and present on the highest hills rounded water worn stones from one to eight inches or a foot in diameter. Four miles east of Columbiana iron ore occurs constituting a hill of considerable eminence, and at Lee's ferry, I observed, on both sides of the river, but many feet above its present level, beds of shells, chiefly